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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/849,571 | 05/20/2004 | Weidong Zhu | 266923-000007USPT | 6579 |

70601 7590 03/09/2010
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| EXAMINER | |
|---|---|
| NGHIEM, MICHAEL P | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2863 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 03/09/2010 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/849,571 | ZHU ET AL. | |
| | Examiner | Art Unit | |
| | MICHAEL P. NGHIEM | 2863 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *10 December 2009,24&25 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *15,16,47-54 and 56-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15,16,47-54,56-58,60 and 61* is/are rejected.

7)☒ Claim(s) *59* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 May 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

The Amendments filed on December 10, 2009 and September 24&25, 2009 have been considered.

### *Petition*

The petition filed on December 10, 2009 has been granted.

The petition filed on September 29, 2009 has been dismissed on November 23, 2009.

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 24, 2009 has been entered.

### *Withdrawal of Allowability*

The indicated allowability of claims 48, 50-54, 56-58, and 61 is withdrawn in view of the newly discovered reference(s) to Zhu et al. (US 2008/0294354) and Stubbs (US 5,327,358). Rejections based on the newly cited reference(s) follow.

### *Drawings*

The drawings filed on May 20, 2004 are not acceptable because:

1/ Black shading is not acceptable, 37 CFR 1.84(m): See e.g. Figs. 10, 12, 16, 22.

2/ Character of lines, numbers, and letters are not uniformly thick and well-defined, 37 CFR 1.84(l): See e.g. Figs. 26's, 27's, and 28-30.

### *Claim Objections*

Claim 56 is objected to because of the following informalities: after "comprising" (line 4), "," should be -- : --; "the force" (lines 8-9) lacks antecedent basis. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 47, 49, and 60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 47, 49, and 60, why is that when the "number of the stiffness parameters being larger than a number of system equations", "the system equations are severely underdetermined"? The system equations being severely underdetermined is not understood.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 47, 49, and 60 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The "number of stiffness parameters is larger than a number of system equations such that the system equations are severely underdetermined" is not described in the original disclosure.

***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 15, 16, 48, 50-54, 56-59, and 61 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 6, 17-20, and 36-40 of copending Application No. 12/153,348 (Zhu et al.). Although the conflicting claims are not identical, they are not patentably distinct from each other because Zhu et al. ('348) claims:

Regarding claims 15 and 51-54, a system for determining damage information of a structure (claim 17), comprising:

a sensor arranged to measure vibrations of a structure (claim 17, lines 3-4)

a stiffness parameter unit for receiving said vibration information, determining natural frequency data of said structure, and determining the stiffness parameters of said structure using said natural frequency data (claim 17, lines 5-8); and

a damage information processor for receiving said stiffness parameters and outputting damage information comprising spatial damage information on said structure, said spatial damage information comprising a damage location along said lengthwise dimension of said structure (claims 18, 19).

Regarding 16, said damage information processor outputs extent of damage information (claim 20).

Regarding claims 48, 50, and 61, a system for determining stiffness parameters of a structure (claim 1), comprising:

a sensor arranged to measure vibrations of said structure and output vibration information (claim 1, lines 3-4); and

a stiffness parameter unit for receiving said vibration information, determining natural frequency data of said structure, and determining the stiffness parameters of said structure using said natural frequency data (claim 1, lines 5-8);

wherein said stiffness parameter unit comprises an iterative processing unit (claim 3) that determines said stiffness parameters using a second or higher order perturbation process (claim 6).

Regarding claim 56, a system (claim 36), comprising:

a structure (claim 36, line 2);

a random impact device for introducing vibrations in said structure (claim 36, lines 3-5), said random impact device comprising,

a random signal generating unit for generating first and second outputs (claim 37, lines 3-4);

a random impact actuator for receiving said first and second outputs (claim 37, lines 5-6); and

an impact applicator coupled to said random impact actuator (claim 37, lines 7-8), wherein said random impact actuator drives said impact applicator such that the force and arrival times of said impact applicator at said structure are random (claim 37, lines 9-11);

a sensor arranged to measure vibrations of said structure and output vibration information (claim 36, lines 6-7); and

a stiffness parameter unit for receiving said vibration information, determining natural frequency data of said structure, and determining the stiffness parameters of said structure using said natural frequency data (claim 36, lines 8-11).

Regarding claim 57, said random impact actuator drives said impact applicator in accordance with said first and second outputs (claim 38).

Regarding claim 58, the first and second outputs comprise independent random variables (claim 39).

Regarding claim 59, the first and second outputs determine the force and arrival times, respectively, of the impact applicator at said structure (claim 40).

However, regarding claim 15, Zhu et al. ('354) does not claim the structure having a lengthwise dimension much greater in magnitude than cross-sectional dimensions. However, it is obvious to determine damage of structures having a lengthwise dimension much greater in magnitude than cross-sectional dimensions, since these structures are prone to vibrating along the lengthwise direction.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 15, 16, 48, 50-54, and 61 are rejected under 35 U.S.C. 102(b) as being anticipated by Stubbs (US 5,327,358).

Regarding claims 15, 51, 52, and 54, Stubbs discloses a system for determining damage information of a structure (Abstract, lines 1-2), comprising:

a sensor (claim 1, line 4) arranged to measure vibrations of a structure (claim 1, lines 4-5) having a lengthwise dimension much greater in magnitude than cross-sectional dimensions thereof (e.g. power poles, column 1, line 16) and to output vibration information (measured first signal, claim 1, lines 4-5);

a stiffness parameter unit for receiving said vibration information (column 1, lines 56-58; column 25, lines 31-34; 104, Fig. 5), determining natural frequency data of said structure (column 5, lines 8-9; column 7, lines 17-21; Table 14), and determining the stiffness parameters of said structure using said natural frequency data (using equation 1, column 5, which expresses the relationship between natural frequencies and stiffness parameter); and

a damage information processor (10) for receiving said stiffness parameters and outputting damage information comprising spatial damage information on said structure (column 2, line 51 – column 3, line 5), said spatial damage information comprising a damage location along said lengthwise dimension of said structure (column 2, lines 36-39).

Regarding claims 16, 53, and 54, Stubbs discloses said damage information processor outputs extent of damage information (column 2, lines 49-50).

Regarding claims 48, 50, and 61, Stubbs discloses a system for determining stiffness parameters of a structure (104, Fig. 5), comprising:

a sensor (claim 1, line 4) arranged to measure vibrations of said structure (claim 1, lines 4-5) and output vibration information (measured first signal, claim 1, lines 4-5); and

a stiffness parameter unit for receiving said vibration information (column 1, lines 56-58; column 25, lines 31-34; 104, Fig. 5), determining natural frequency data of said structure (column 5, lines 8-9; column 7, lines 17-21; Table 14), and determining the stiffness parameters of said structure using said natural frequency data (using equation 1, column 5, which expresses the relationship between natural frequencies and stiffness parameter);

wherein said stiffness parameter unit comprises an iterative processing unit (iterations, column 35, lines 16-22; column 34, lines 36-37) that determines said stiffness parameters using a second or higher order perturbation process (column 33, lines 36-54; repeating calculation of stiffness, column 34, lines 33-37).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 56-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stubbs.

Regarding claim 56, Stubbs discloses a system (Fig. 5), comprising:

a structure (structure, Abstract, line 1; specimen 42);

a random impact device (impact hammer, column 5, line 51) for introducing vibrations in said structure (column 5, lines 50-53),

an impact applicator (impact hammer has steel tip, Google search, page 1, paragraph 2) such that the force (40) and arrival times of said impact applicator at said structure (42) are random (column 5, lines 50-53);

such that the force (40) and arrival times of said impact applicator at said structure (42) are random (column 5, lines 50-53);

a sensor (claim 1, line 4) arranged to measure vibrations of said structure (claim 1, lines 4-5) and output vibration information (measured first signal, claim 1, lines 4-5); and

a stiffness parameter unit for receiving said vibration information (column 1, lines 56-58; column 25, lines 31-34; 104, Fig. 5), determining natural frequency data of said structure (column 5, lines 8-9; column 7, lines 17-21; Table 14), and determining the stiffness parameters of said structure using said natural frequency data (using equation 1, column 5, which expresses the relationship between natural frequencies and stiffness parameter).

However, Stubbs does not disclose the following claimed features:

- Regarding claim 56, said random impact device comprising a random signal generating unit for generating first and second outputs; a random impact actuator for receiving said first and second outputs; and an impact applicator coupled to said random impact actuator, wherein said random impact actuator drives said impact applicator.
- Regarding claim 57, said random impact actuator drives said impact applicator in accordance with said first and second outputs.
- Regarding claim 58, the first and second outputs comprise independent random variables.

Nevertheless, Stubbs discloses that the random impact device is a PCB board (PCB 086B01, column 5, line 51). It would be obvious to electrically actuate the PCB impact device with electric signals since the device is an electrical device.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide the impact device of Stubbs with electrically actuation means for the purpose of generating a force for inciting vibrations on a structure. Control of the impact device would be improved if the device is electrically actuated.

***Allowable Subject Matter***

Claim 59 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Reasons For Allowance***

The following is an examiner's statement of reasons for allowance:

The **combination** as claimed wherein a system comprising the first and second outputs determine the force and arrival times, respectively, of the impact applicator at said structure (claim 59) is not disclosed, suggested, or made obvious by the prior art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Response to Arguments***

Applicant's arguments filed on December 10 and September 24&25, 2009 have been fully considered but they are not persuasive.

With respect to the 35 USC 112, 2nd paragraph, rejections of claims 47, 49, and 60, Applicants argue that "for a linear system having m equations and n unknowns, the system is "underdetermined" if n > m (and is "overdetermined" if m > n). Severely underdetermined system of linear equations include systems wherein n >> m (i.e., far more unknowns than equations, where n represents unknowns and m represents equations)".

Examiner's position is that the claims recite "the number of stiffness parameter being larger than a number of system equations". It is unclear whether the stiffness parameters are "unknown" parameters since the stiffness parameters are already determined by the stiffness parameter unit (see e.g. claim 47, lines 8-10).

With respect to the 35 USC 112, 1st paragraph, rejection, Applicants argue that "Applicant's specification discloses, *inter alia,* damage detection using changes of natural frequencies '[f]or structures such as beams and lightning masts in electric substations, using only the changes in the natural frequencies can relatively accurately

detect the location(s) and extent of damage, even though the system equations are *severely underdetermined* in each iteration' (¶¶ [0181]-[0182])(emphasis added) and discusses an example of an aluminum beam test specimen (see FIG. 12) with *"severely underdetermined system equations* (5 equations with 80 unknowns)." (¶ [0188])(emphasis added)".

Examiner's position is that paragraphs [0181], [0182], and [0188] do not disclose comparing the system equations with the stiff parameter. Instead, paragraph [0188], e.g., describes comparing the system equations with the "m" unknowns (paragraph [0188], lines 22-24).

Applicants further argue that "[t]he claim amendments in question were introduced in the Supplemental Amendment filed on December 29, 2008, and did particularly point out where the originally filed disclosure supported the amendments. Accordingly, the Examiner has failed to discharge his burden and has further failed to set forth any factual findings supporting the conclusory allegation of lack of written description. *See, e.g., Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000)(the written description "inquiry is a factual one and must be assessed on a case-by-case basis")".

Examiner's position is that Examiner responded to the Supplemental Amendment on April 24, 2009 with factual findings supporting the conclusory allegation of lack of written

description: "Examiner's position is that paragraphs [0130] and [0188] describe comparing the system equations with the "m" unknowns (see paragraphs 0130, lines 20-25; paragraph 0188, lines 22-24). However, paragraphs [0130] and [0188] do not disclose comparing the system equations with the stiff parameter (e.g., G_i**(0), paragraph 0130, line 27)" (see Office Action, filed on April 24, 2009, page 10, paragraph 2).

Applicant's remaining arguments have been considered but are moot in view of the new ground(s) of rejection.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Nghiem whose telephone number is (571) 272-2277. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Michael P. Nghiem/

Primary Examiner, GAU 2863

March 1, 2010